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Joseph et al.

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(54) **ENHANCEMENT TO SYSTEM INFORMATION BLOCK (SIB) VALIDITY CHECK FOR NON-PUBLIC NETWORKS (NPNS)**

(71) Applicant: **QUALCOMM Incorporated**, San Diego, CA (US)

(72) Inventors: **Vinay Joseph**, Calicut (IN); **Masato Kitazoe**, Tokyo (JP); **Rajat Prakash**, San Diego, CA (US)

(73) Assignee: **QUALCOMM Incorporated**, San Diego, CA (US)

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(51) **Int. Cl.**

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H04W 48/08	(2009.01)
H04W 12/10	(2021.01)
H04W 84/04	(2009.01)

(52) **U.S. Cl.**

CPC ***H04W 48/16*** (2013.01); ***H04W 12/10*** (2013.01); ***H04W 48/08*** (2013.01); *H04W 84/042* (2013.01)

(58) **Field of Classification Search**

CPC H04W 48/16; H04W 12/10; H04W 48/08; H04W 84/042; H04W 84/105; H04W 48/12

See application file for complete search history.

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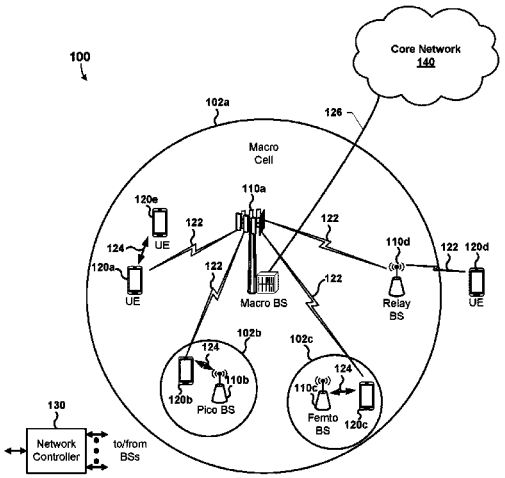
Primary Examiner — Minjung Kim

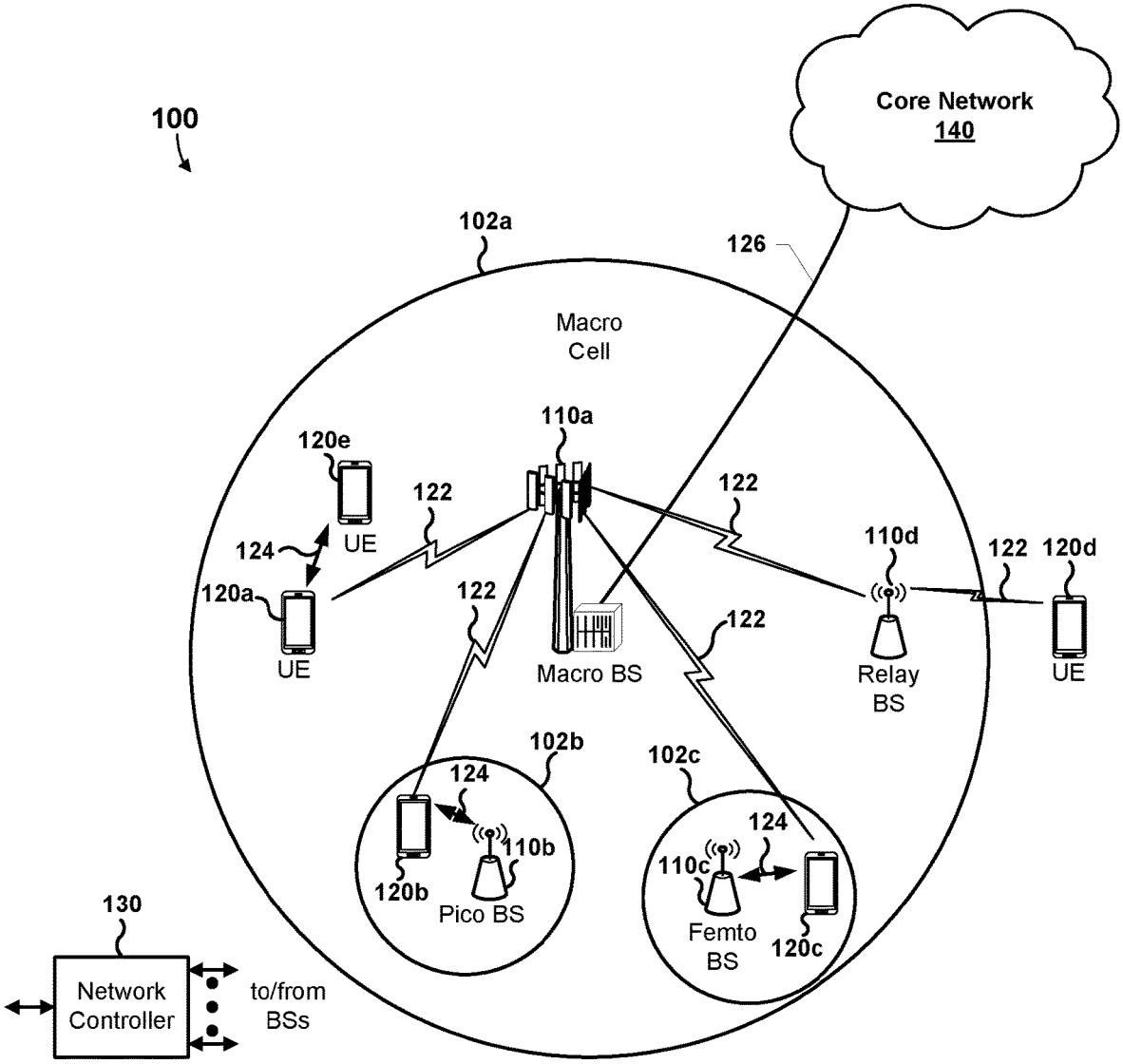
(74) *Attorney, Agent, or Firm* — The Marbury Law Group, PLLC

(57) **ABSTRACT**

This disclosure provides systems, methods, and apparatus, including computer programs encoded on computer storage media, for operating a user equipment (UE) in a next generation (NG) radio access network (RAN) (NG-RAN) to validate a system information block (SIB) for non-public networks (NPNs). In one aspect, a UE receiving a SIB-one (SIB1) from a cell of the NG-RAN may determine whether the cell supports non-public networks (NPNs) based on the received SIB1. If so case, the UE may determine whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID of a SIB stored in memory. If so, the UE may validate the stored SIB based at least in part on the received SIB1. If not, the UE may invalidate the stored SIB and obtain a new SIB per standard procedures.

22 Claims, 9 Drawing Sheets

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Core Network
140
126
102a
Macro
Cell
110a
120e
UE
122
124
120a
UE
122
122
110d
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UE
122
Macro BS
Relay
BS
UE
102b
102c
124
110b
120b
Pico BS
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Femto
BS
120c
130
Network
Controller
to/from
BSs

FIG. 1

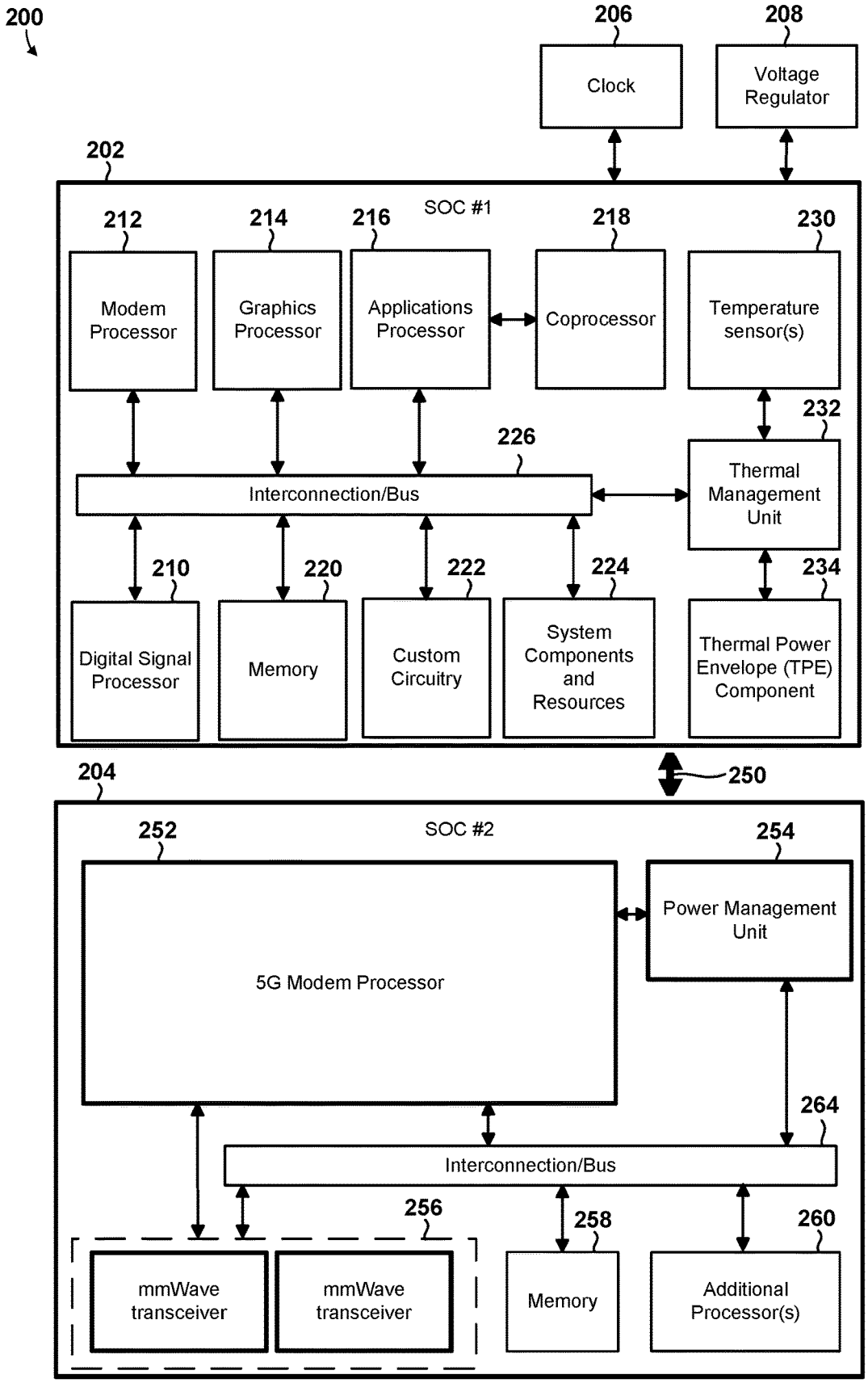
200
206
Clock
208
Voltage Regulator
202
SOC #1
212
Modem Processor
214
Graphics Processor
216
Applications Processor
218
Coprocessor
230
Temperature sensor(s)
232
226
Interconnection/Bus
Thermal Management Unit
210
Digital Signal Processor
220
Memory
222
Custom Circuitry
224
System Components and Resources
234
Thermal Power Envelope (TPE) Component
204
250
252
SOC #2
254
5G Modem Processor
Power Management Unit
264
Interconnection/Bus
256
258
260
mmWave transceiver
mmWave transceiver
Memory
Additional Processor(s)

FIG. 2

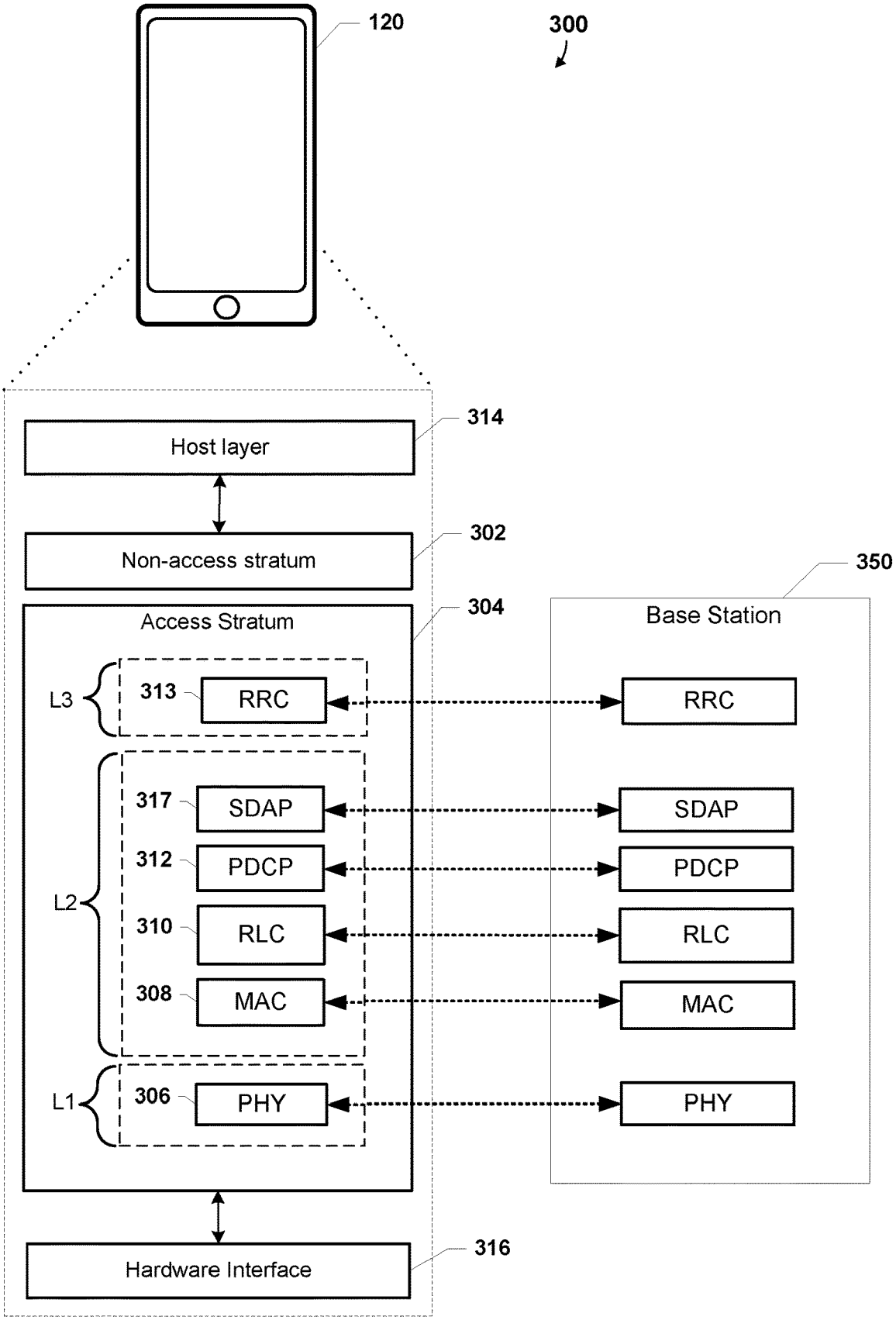
120
300
314
Host layer
302
Non-access stratum
304
Access Stratum
L3
313
RRC
L2
317
SDAP
312
PDCP
310
RLC
308
MAC
L1
306
PHY
316
Hardware Interface
350
Base Station
RRC
SDAP
PDCP
RLC
MAC
PHY

FIG. 3

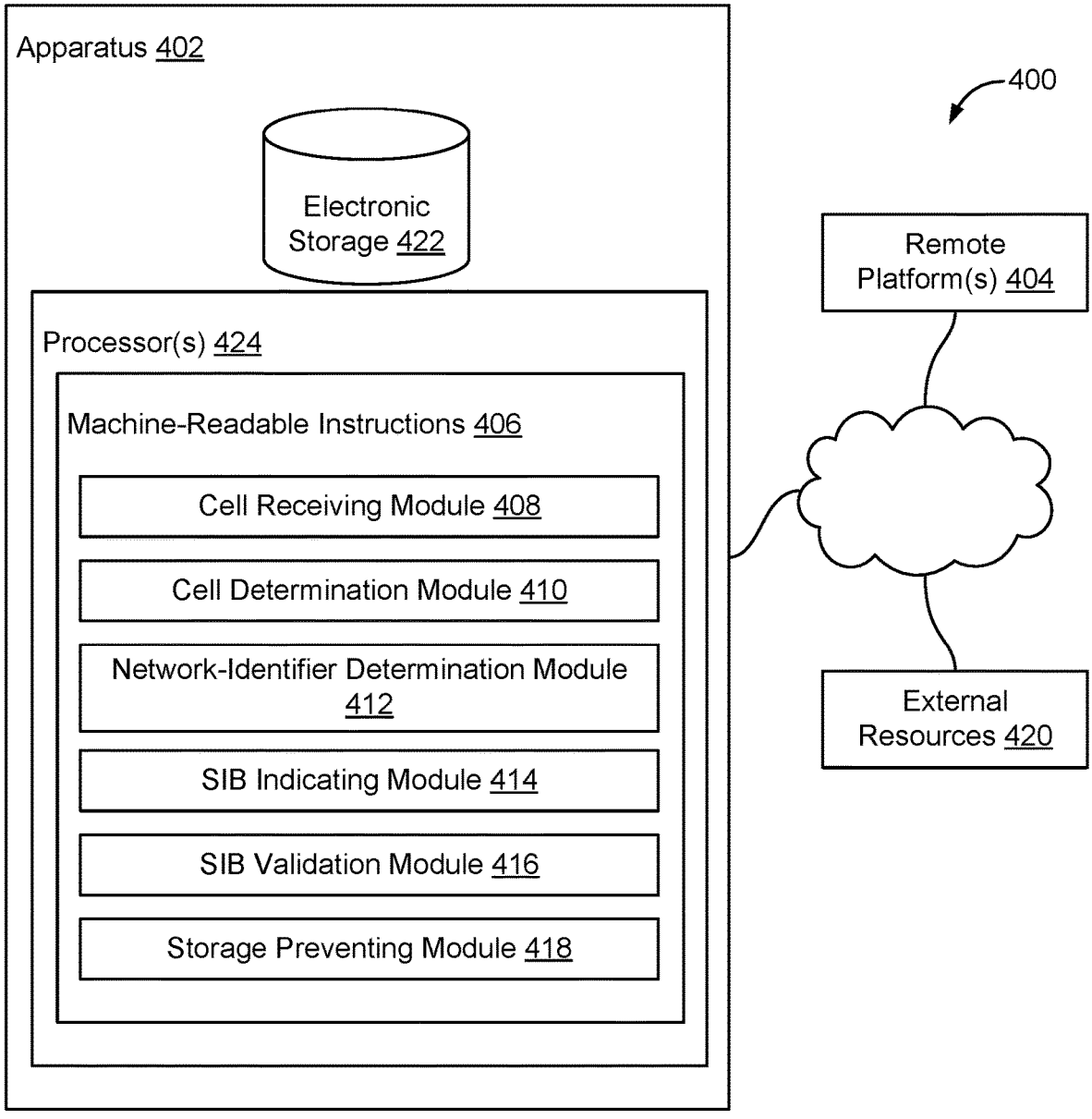
Apparatus 402
400
Electronic Storage 422
Remote Platform(s) 404
Processor(s) 424
Machine-Readable Instructions 406
Cell Receiving Module 408
Cell Determination Module 410
Network-Identifier Determination Module 412
SIB Indicating Module 414
SIB Validation Module 416
Storage Preventing Module 418
External Resources 420

FIG. 4

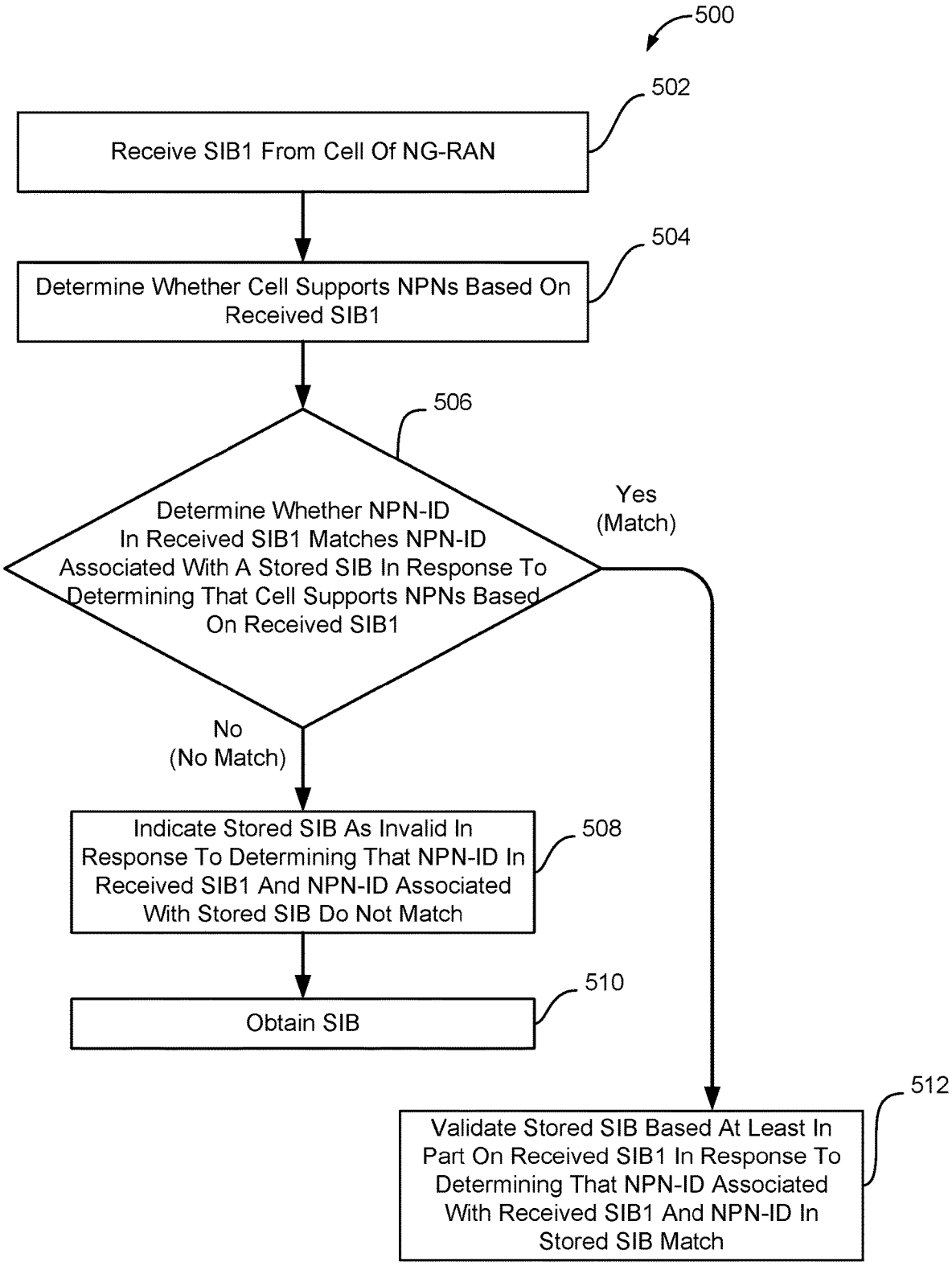
500
502
Receive SIB1 From Cell Of NG-RAN
504
Determine Whether Cell Supports NPNs Based On Received SIB1
506
Determine Whether NPN-ID In Received SIB1 Matches NPN-ID Associated With A Stored SIB In Response To Determining That Cell Supports NPNs Based On Received SIB1
Yes (Match)
No (No Match)
508
Indicate Stored SIB As Invalid In Response To Determining That NPN-ID In Received SIB1 And NPN-ID Associated With Stored SIB Do Not Match
510
Obtain SIB
512
Validate Stored SIB Based At Least In Part On Received SIB1 In Response To Determining That NPN-ID Associated With Received SIB1 And NPN-ID In Stored SIB Match

FIG. 5

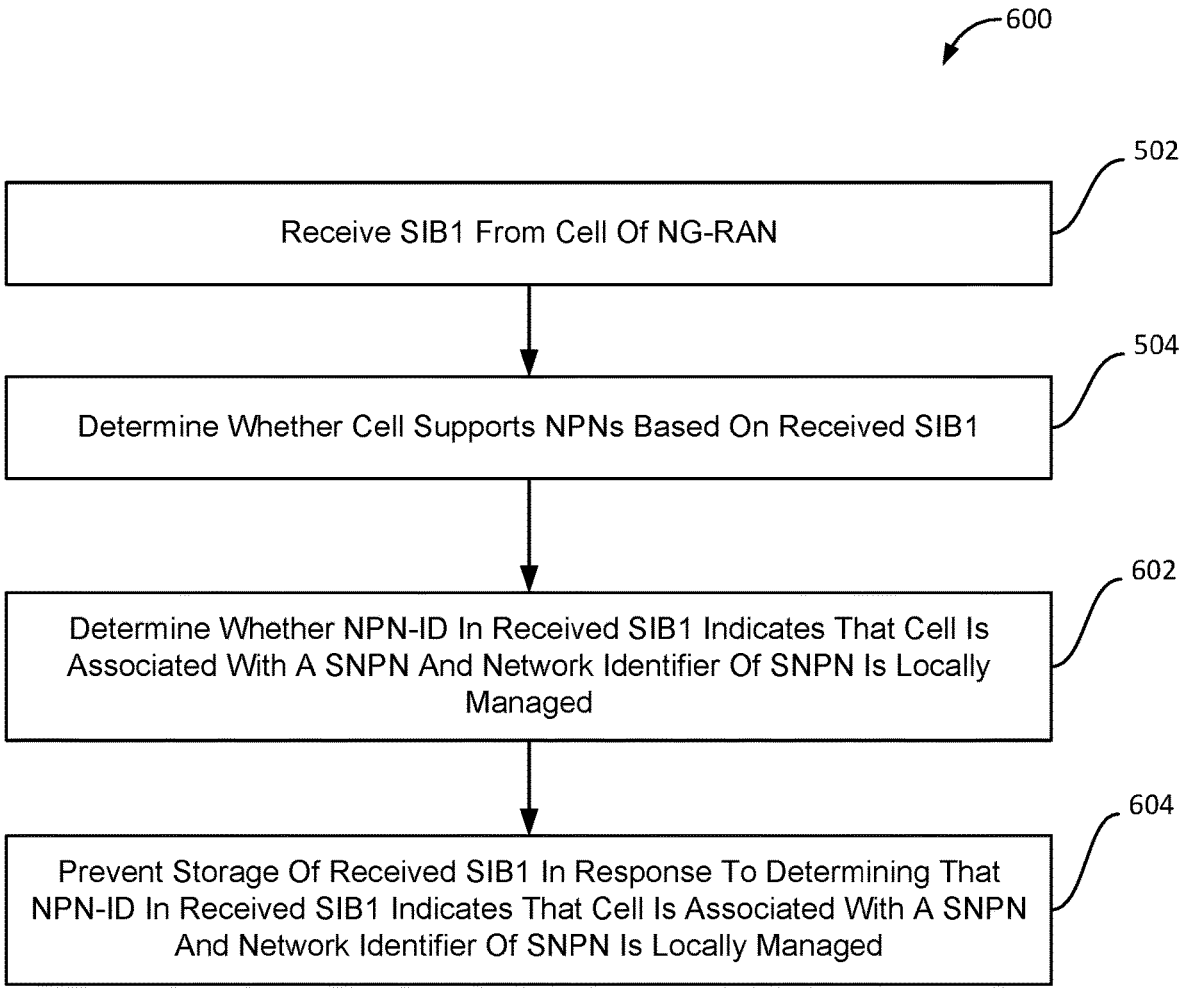
600
502
Receive SIB1 From Cell Of NG-RAN
504
Determine Whether Cell Supports NPNs Based On Received SIB1
602
Determine Whether NPN-ID In Received SIB1 Indicates That Cell Is Associated With A SNPN And Network Identifier Of SNPN Is Locally Managed
604
Prevent Storage Of Received SIB1 In Response To Determining That NPN-ID In Received SIB1 Indicates That Cell Is Associated With A SNPN And Network Identifier Of SNPN Is Locally Managed

FIG. 6

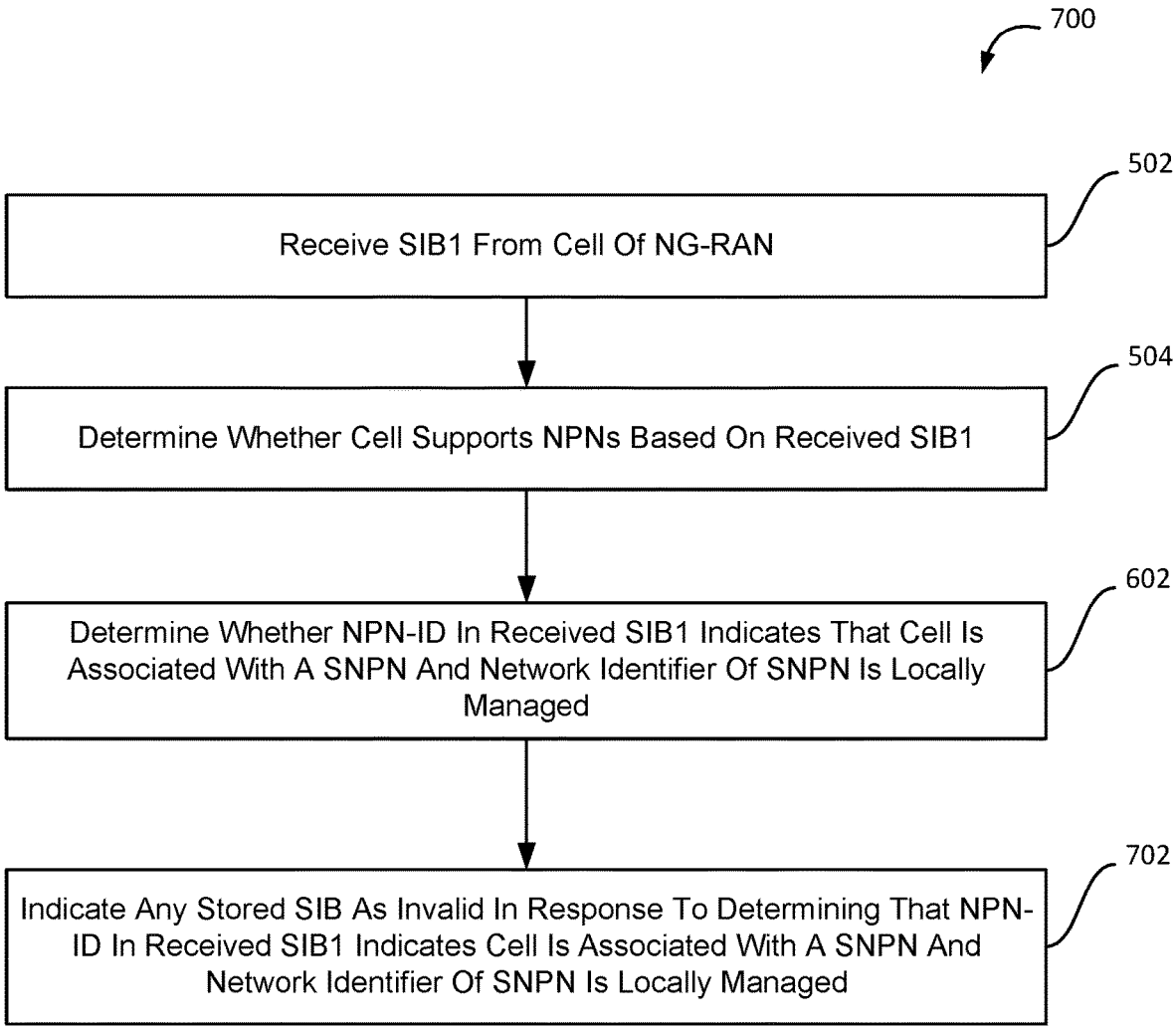
700
502
Receive SIB1 From Cell Of NG-RAN
504
Determine Whether Cell Supports NPNs Based On Received SIB1
602
Determine Whether NPN-ID In Received SIB1 Indicates That Cell Is Associated With A SNPN And Network Identifier Of SNPN Is Locally Managed
702
Indicate Any Stored SIB As Invalid In Response To Determining That NPN-ID In Received SIB1 Indicates Cell Is Associated With A SNPN And Network Identifier Of SNPN Is Locally Managed

FIG. 7

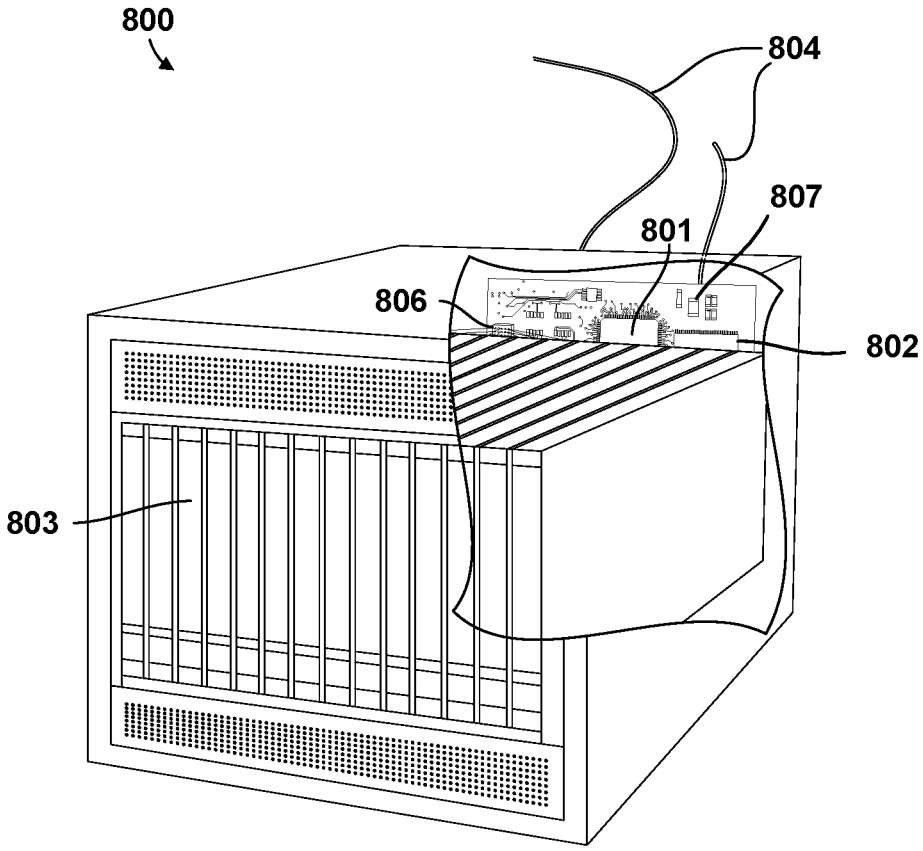

FIG. 8

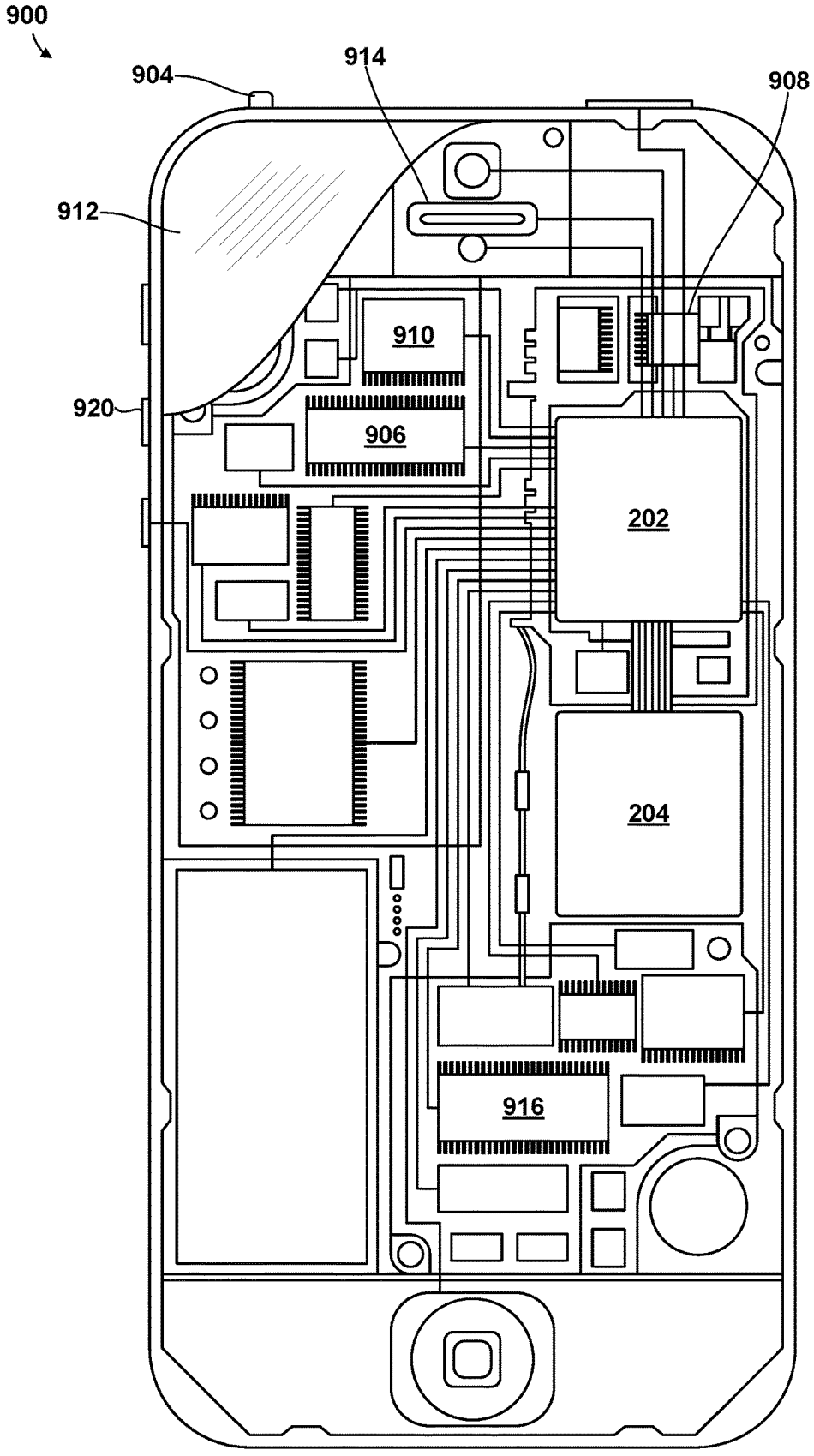

FIG. 9

ENHANCEMENT TO SYSTEM INFORMATION BLOCK (SIB) VALIDITY CHECK FOR NON-PUBLIC NETWORKS (NPNS)

RELATED APPLICATIONS

This application claims the benefit of priority to U.S. Provisional Application No. 62/936,912 entitled "ENHANCEMENT TO SYSTEM INFORMATION BLOCK (SIB) VALIDITY CHECK FOR NON-PUBLIC NETWORKS (NPNs)" filed Nov. 18, 2019, the entire contents of which are hereby incorporated by reference for all purposes.

TECHNICAL FIELD

This disclosure relates to operations using system information blocks (SIBs) in next generation (NG) radio access networks (RANs) (NG-RANs).

DESCRIPTION OF THE RELATED TECHNOLOGY

Long Term Evolution (LTE), Fifth Generation (5G)—new radio (NR), and other recently developed communication technologies allow wireless devices to communicate information at data rates (such as in terms of Gigabits per second, etc.) that are orders of magnitude greater than what was available just a few years ago.

Today's communication networks are also more secure, resilient to multipath fading, allow for lower network traffic latencies, provide better communication efficiencies (such as in terms of bits per second per unit of bandwidth used, etc.). These and other recent improvements have facilitated the emergence of the Internet of Things (IOT), large scale Machine to Machine (M2M) communication systems, vehicles, and other technologies that rely on consistent and secure communications.

SUMMARY

The systems, methods and devices of this disclosure each have several innovative aspects, no single one of which is solely responsible for the desirable attributes disclosed herein.

One innovative aspect of the subject matter described in this disclosure can be implemented in a wireless mobile communication device (hereinafter referred to as "user equipment" or "UE"). Some implementations may include methods performed by an apparatus of a UE for operating in a next generation (NG) radio access network (RAN) (NG-RAN). Various implementations may include receiving a system information block (SIB) one (SIB1) from a cell of the NG-RAN, determining whether the cell supports non-public networks (NPNs) based on the received SIB1, determining whether a NPN-identifier (NPN-ID) in the received SIB1 matches a NPN-ID in a stored SIB in response to determining that the cell supports NPNs based on the received SIB1, and validating the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

In some implementations, determining whether the cell supports NPNs based on the received SIB1 may involve determining whether the cell supports only NPNs based on the received SIB1, and determining whether a NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1 may involve determining whether an NPN-ID in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports only NPNs based on the received SIB.

Some implementations may further include indicating that the stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match. In some implementations, the NPN-ID may be a standalone NPN (SNPN)-identifier (SNPN-ID). In some implementations, the SNPN-ID may include a network identifier (NID) and optionally a public land mobile network (PLMN)-identifier (PLMN-ID). In some implementations, the NPN-ID is a combination of a PLMN-ID and a closed access group (CAG)-identifier (CAG-ID). In some implementations, only a first NPN-ID in the received SIB and only a first NPN-ID associated with the stored SIB are used to determine whether the NPN-ID in the received SIB1 matches the NPN-ID associated with the stored SIB.

Some implementations may further include determining whether an NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed. In some implementations, the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN may be a first NPN in the received SIB1. Some implementations may further include preventing storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed. In some implementations, indicating any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 may indicate that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed. In some implementations, the network identifier of the SNPN being locally managed may be indicated at least in part by one or more bits of the network identifier of the SNPN.

In some implementations, the SIB1 may be received on a downlink-shared channel (DL-SCH). In some implementations, the cell may be a serving cell. In some implementations, the received SIB1 may indicate that the cell supports NPNs by one or more of an information element "cellreservedforotheruse" in the SIB1 set to true and at least one NPN-ID or CAG-ID indicated in the SIB1, an indication in the SIB1 indicates that the cell provides access to NPNs, and only one PLMN-ID is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

Another innovative aspect of the subject matter described in this disclosure can be implemented in an apparatus of a UE. Some implementations may include a first interface configured to receive a SIB1 from a cell of the NG-RAN and a processing system coupled to the first interface and configured to determine whether the cell supports NPNs based on the received SIB1, determine whether a NPN-ID in the received SIB1 matches an NPN-ID in a stored SIB in response to determining that the cell supports NPNs based on the received SIB1, and validate the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

In some implementations, the processing system may determine whether the cell supports NPNs based on the received SIB1 by determining whether the cell supports only

NPNs based on the received SIB1, and determine whether a NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports only NPNs based on the received SIB1.

In some implementations, the processing system may be further configured to indicate that the stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match. In some implementations, the processing system may be configured such that the NPN-ID may be a SNPN-ID. In some implementations, the processing system may be configured such that the SNPN-ID may include a network identifier (NID) and optionally a PLMN-ID. In some implementations, the processing system may be configured such that the NPN-ID is a combination of a PLMN-ID and a CAG-ID. In some implementations, the processing system may be configured such that only a first NPN-ID in the received SIB and only a first NPN-ID associated with the stored SIB are used to determine whether the NPN-ID in the received SIB1 matches the NPN-ID associated with the stored SIB.

In some implementations, the processing system may be further configured to determine whether an NPN-ID in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed. In some implementations, the processing system may be configured such that the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN may be a first NPN in the received SIB1. In some implementations, the processing system may be further configured to prevent storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed. In some implementations, the processing system may be configured such that indicating any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 may indicate that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed. In some implementations, the processing system may be configured such that the network identifier of the SNPN being locally managed may be indicated at least in part by one or more bits of the network identifier of the SNPN.

In some implementations, the first interface may be configured such that the SIB1 may be received on a DL-SCH. In some implementations, the cell may be a serving cell. In some implementations, the received SIB1 may indicate that the cell supports NPNs by one or more of an information element "cellreservedforotheruse" in the SIB1 set to true and at least one NPN-ID or CAG-ID indicated in the SIB1, an indication in the SIB1 indicates that the cell only provides access to NPNs, and only one PLMN-ID is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

Another innovative aspect of the subject matter described in this disclosure can be implemented in a non-transitory processor-readable medium having stored thereon processor-executable instructions configured to cause a UE to perform various operations, some implementations of which may include receiving a SIB1 from a cell of the NG-RAN, determining whether the cell supports NPNs based on the received SIB1, determining whether an NPN-ID in the received SIB1 matches a NPN-ID in a stored SIB in response to determining that the cell supports NPNs based on the received SIB1, and validating the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

Another innovative aspect of the subject matter described in this disclosure can be implemented in a UE that includes means for receiving a SIB1 from a cell of the NG-RAN, means for determining whether the cell supports NPNs based on the received SIB1, means for determining whether an NPN-ID in the received SIB1 matches a NPN-ID in a stored SIB in response to determining that the cell supports NPNs based on the received SIB1, and means for validating the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

Details of one or more implementations of the subject matter described in this disclosure are set forth in the accompanying drawings and the description below. Other features, aspects, and advantages will become apparent from the description, the drawings and the claims. Note that the relative dimensions of the following figures may not be drawn to scale.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a system block diagram illustrating an example communications system.

FIG. **2** shows a component block diagram illustrating an example computing system that may be configured to implement operations in a next generation (NG) radio access network (RAN) (NG-RAN).

FIG. **3** shows a component block diagram of an example software architecture including a radio protocol stack for the user and control planes in wireless communications.

FIG. **4** shows a component block diagram illustrating an example system configured for operations in an NG-RAN.

FIG. **5** shows a process flow diagram for an example method for implementing operations in an NG-RAN by an apparatus of a user equipment (UE).

FIG. **6** shows a process flow diagram for an example method for implementing operations in an NG-RAN by an apparatus of a UE.

FIG. **7** shows a process flow diagram for an example method for implementing operations in an NG-RAN by an apparatus of a UE.

FIG. **8** shows a component block diagram of an example network computing device.

FIG. **9** shows a component block diagram of an example UE.

Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

The following description is directed to certain implementations for the purposes of describing the innovative aspects of this disclosure. However, a person having ordinary skill in the art will readily recognize that the teachings herein may be applied in a multitude of different ways.

The described implementations may be implemented in any device, system, or network that is capable of transmitting and receiving radio frequency (RF) signals according to any of the Institute of Electrical and Electronics Engineers (IEEE) 16.11 standards, or any of the IEEE 802.11 standards, the Bluetooth® standard, code division multiple access (CDMA), frequency division multiple access (FDMA), time division multiple access (TDMA), Global

System for Mobile communications (GSM), GSM/General Packet Radio Service (GPRS), Enhanced Data GSM Environment (EDGE), Terrestrial Trunked Radio (TETRA), Wideband-CDMA (W-CDMA), Evolution Data Optimized (EV-DO), 1×EV-DO, EV-DO Rev A, EV-DO Rev B, High Speed Packet Access (HSPA), High Speed Downlink Packet Access (HSDPA), High Speed Uplink Packet Access (HSUPA), Evolved High Speed Packet Access (HSPA+), Long Term Evolution (LTE), AMPS, or other signals that are used to communicate within a wireless, cellular or Internet of Things (IoT) network, such as a system utilizing 3G, 4G, or 5G technology, or further implementations thereof.

Various implementations described in this disclosure include methods performed by an apparatus (such as a processing system) of a UE for implementing operations in a next generation (NG) radio access network (RAN) (NG-RAN).

Some implementations may provide an enhancement to a validity check of a system information block (SIB, such as a SIB1, SIB3, SIB4, etc.). In some implementations, if a cell provides access to NPNs, an NPN-ID (such as a SNPN-ID or PLMN-ID+CAG-ID) broadcast in a SIB1 may be used for a SIB validity check. In some implementations, the first NPN-ID broadcast in the SIB1 may be used for SIB validity checks. In some implementations, an NPN-ID other than the first NPN-ID broadcast in the SIB1 may be used for SIB validity checks. In some implementations, if the cell doesn't provide access to only NPNs, the first PLMN-ID in the PLMN-IdentityInfoList element of the SIB1 may be used for a SIB validity check. As an example, a cell that only provides access to NPNs may be an NPN-only cell.

In some implementations, a cell may be determined to provide access only to NPNs based on one or more of the following: 1) the cell broadcasting a cellreservedforotheruse information element set to true and broadcasting at least one of a network identifier (NID) or CAG-ID; 2) the cell broadcasting an indication to indicate that the cell provides access only to NPNs; or 3) only one PLMN-ID being included in the PLMN-IdentityInfoList element and set to a specific Third Generation Partnership Project (3GPP) value.

In some implementations, a UE may not store a SIB from a cell if an NPN-ID in the SIB (such as the first NPN-ID or an NPN-ID other than the first NPN-ID) is associated with a SNPN and the associated broadcasted NID is a locally managed one.

In some implementations, a UE may consider a stored SIB to be invalid an NPN-ID in the SIB (such as the first NPN-ID or an NPN-ID other than the first NPN-ID) is associated with a SNPN and the associated broadcasted NID is a locally managed one.

Particular implementations of the subject matter described in this disclosure can be implemented to realize one or more of the following potential advantages. Some implementations may improve operations of a UE to validate stored SIBs, specifically stored SIBs associated with NPNs. Validating stored SIBs may enable faster system information (SI) acquisition after events triggering SI acquisition (such as after cell re-selection, upon return from out of coverage, after reception of an SI change indication, etc.) because valid SIBs may be reused, rather than requiring the UE to download the already stored valid SIBs. Some implementations may improve the operations of a UE in a SNPN that is associated with a locally managed NID by preventing misuse of a wrong SIB due to collision or confusion between NIDs and thereby preventing unwanted emissions that may violate emission settings or regulations.

The terms "wireless device" or "computing device" are used interchangeably herein to refer to any one or all of wireless router devices, wireless appliances, cellular telephones, smartphones, portable computing devices, personal or mobile multi-media players, laptop computers, tablet computers, smartbooks, ultrabooks, palmtop computers, wireless electronic mail receivers, multimedia Internet-enabled cellular telephones, medical devices and equipment, biometric sensors/devices, wearable devices including smart watches, smart clothing, smart glasses, smart wrist bands, smart jewelry (for example smart rings, smart bracelets, etc.), entertainment devices (for example wireless gaming controllers, music and video players, satellite radios, etc.), wireless-network enabled Internet of Things (IoT) devices including smart meters/sensors, industrial manufacturing equipment, large and small machinery and appliances for home or enterprise use, wireless communication elements within vehicles, wireless devices affixed to or incorporated into various mobile platforms, global positioning system devices, and similar electronic devices that include a memory, wireless communication components and a programmable apparatus (such as a processing system).

The term "system on chip" (SOC) is used herein to refer to a single integrated circuit (IC) chip that contains an apparatus (such as a processing system) of multiple resources or processors integrated on a single substrate. A single SOC may contain circuitry for digital, analog, mixed-signal, and radio-frequency functions. A single SOC also may include any number of general purpose or specialized processors (digital signal processors, modem processors, video processors, etc.), memory blocks (for example ROM, RAM, Flash, etc.), and resources (for example timers, voltage regulators, oscillators, etc.). SOCs also may include software for controlling the integrated resources and processors, as well as for controlling peripheral devices.

The term "system in a package" (SIP) may be used herein to refer to a single module or package that contains an apparatus (such as a processing system) of multiple resources, computational units, cores or processors on two or more IC chips, substrates, or SOCs. For example, a SIP may include a single substrate on which multiple IC chips or semiconductor dies are stacked in a vertical configuration. Similarly, the SIP may include one or more multi-chip modules (MCMs) on which multiple ICs or semiconductor dies are packaged into a unifying substrate. A SIP also may include multiple independent SOCs coupled together via high speed communication circuitry and packaged in close proximity, such as on a single motherboard or in a single wireless device. The proximity of the SOCs facilitates high speed communications and the sharing of memory and resources.

The term "multicore processor" may be used herein to refer to a single integrated circuit (IC) chip or chip package that contains two or more independent processing cores (for example CPU core, Internet protocol (IP) core, graphics processor unit (GPU) core, etc.) configured to read and execute program instructions. A SOC may include multiple multicore processors, and each processor in an SOC may be referred to as a core. The term "multiprocessor" may be used herein to refer to a system or device that includes two or more processing units configured to read and execute program instructions.

The term "processing system" is used herein to refer to a processor, a SOC, or a SIP, coupled to or including a memory device.

FIG. **1** shows a system block diagram illustrating an example communications system **100**. The communications

system **100** may be a 5G NR network (such as a next generation (NG) radio access network (RAN) (NG-RAN)), or any other suitable network such as an LTE network.

The communications system **100** may include a heterogeneous network architecture that includes a core network **140** and a variety of mobile devices (illustrated as wireless device **120***a*-**120***e* in FIG. **1**). The communications system **100** also may include a number of base stations (illustrated as the BS **110***a*, the BS **110***b*, the BS **110***c*, and the BS **110***d*) and other network entities. A base station is an entity that communicates with wireless devices (mobile devices or UE computing devices), and also may be referred to as an NodeB, a Node B, an LTE evolved nodeB (eNB), an access point (AP), a radio head, a transmit receive point (TRP), a New Radio base station (NR BS), a 5G NodeB (NB), a Next Generation NodeB (gNB), or the like. Each base station may provide communication coverage for a particular geographic area. In 3GPP, the term "cell" can refer to a coverage area of a base station, a base station subsystem serving this coverage area, or a combination thereof, depending on the context in which the term is used.

A base station **110***a*-**110***d* may provide communication coverage for a macro cell, a pico cell, a femto cell, another type of cell, or a combination thereof. A macro cell may cover a relatively large geographic area (for example, several kilometers in radius) and may allow unrestricted access by mobile devices with service subscription. A pico cell may cover a relatively small geographic area and may allow unrestricted access by mobile devices with service subscription. A femto cell may cover a relatively small geographic area (for example, a home) and may allow restricted access by mobile devices having association with the femto cell (for example, mobile devices in a closed subscriber group (CSG)). A base station for a macro cell may be referred to as a macro BS. A base station for a pico cell may be referred to as a pico BS. A base station for a femto cell may be referred to as a femto BS or a home BS. In the example illustrated in FIG. **1**, a base station **110***a* may be a macro BS for a macro cell **102***a*, a base station **110***b* may be a pico BS for a pico cell **102***b*, and a base station **110***c* may be a femto BS for a femto cell **102***c*. A base station **110***a*-**110***d* may support one or multiple (for example, three) cells. The terms "eNB", "base station", "NR BS", "gNB", "TRP", "AP", "node B", "5G NB", and "cell" may be used interchangeably herein.

In some examples, a cell may not be stationary, and the geographic area of the cell may move according to the location of a mobile base station. In some examples, the base stations **110***a*-**110***d* may be interconnected to one another as well as to one or more other base stations or network nodes (not illustrated) in the communications system **100** through various types of backhaul interfaces, such as a direct physical connection, a virtual network, or a combination thereof using any suitable transport network

The base station **110***a*-**110***d* may communicate with the core network **140** over a wired or wireless communication link **126**. The wireless device **120***a*-**120***e* (or UE computing device) may communicate with the base station **110***a*-**110***d* over a wireless communication link **122**.

The wired communication link **126** may use a variety of wired networks (for example Ethernet, TV cable, telephony, fiber optic and other forms of physical network connections) that may use one or more wired communication protocols, such as Ethernet, Point-To-Point protocol, High-Level Data Link Control (HDLC), Advanced Data Communication Control Protocol (ADCCP), and Transmission Control Protocol/Internet Protocol (TCP/IP).

The communications system **100** also may include relay stations (for example relay BS **110***d*). A relay station is an entity that can receive a transmission of data from an upstream station (for example, a base station or a mobile device) and send a transmission of the data to a downstream station (for example, a wireless device or a base station). A relay station also may be a mobile device that can relay transmissions for other wireless devices. In the example illustrated in FIG. **1**, a relay station **110***d* may communicate with macro the base station **110***a* and the wireless device **120***d* in order to facilitate communication between the base station **110***a* and the wireless device **120***d*. A relay station also may be referred to as a relay base station, a relay base station, a relay, etc.

The communications system **100** may be a heterogeneous network that includes base stations of different types, for example, macro base stations, pico base stations, femto base stations, relay base stations, etc. These different types of base stations may have different transmit power levels, different coverage areas, and different impacts on interference in communications system **100**. For example, macro base stations may have a high transmit power level (for example, 5 to 40 Watts) whereas pico base stations, femto base stations, and relay base stations may have lower transmit power levels (for example, 0.1 to 2 Watts).

A network controller **130** may couple to a set of base stations and may provide coordination and control for these base stations. The network controller **130** may communicate with the base stations via a backhaul. The base stations also may communicate with one another, for example, directly or indirectly via a wireless or wireline backhaul.

The wireless devices (UE computing devices) **120***a*, **120***b*, **120***c* may be dispersed throughout communications system **100**, and each wireless device may be stationary or mobile. A wireless device also may be referred to as an access terminal, a terminal, a mobile station, a subscriber unit, a station, etc.

A macro base station **110***a* may communicate with the communication network **140** over a wired or wireless communication link **126**. The wireless devices **120***a*, **120***b*, **120***c* may communicate with a base station **110***a*-**110***d* over a wireless communication link **122**.

Wired communication links may use a variety of wired networks (such as Ethernet, TV cable, telephony, fiber optic and other forms of physical network connections) that may use one or more wired communication protocols, such as Ethernet, Point-To-Point protocol, High-Level Data Link Control (HDLC), Advanced Data Communication Control Protocol (ADCCP), and Transmission Control Protocol/Internet Protocol (TCP/IP).

The wireless communication links **122**, **124** may include a plurality of carrier signals, frequencies, or frequency bands, each of which may include a plurality of logical channels. The wireless communication links **122** and **124** may utilize one or more radio access technologies (RATs). Examples of RATs that may be used in a wireless communication link include 3GPP LTE, 3G, 4G, 5G (for example NR), GSM, Code Division Multiple Access (CDMA), Wideband Code Division Multiple Access (WCDMA), Worldwide Interoperability for Microwave Access (WiMAX), Time Division Multiple Access (TDMA), and other mobile telephony communication technologies cellular RATs. Further examples of RATs that may be used in one or more of the various wireless communication links **122**, **124** within the communication system **100** include medium range protocols such as Wi-Fi, LTE-U, LTE-Direct, LAA, MuLTEfire,

and relatively short range RATs such as ZigBee, Bluetooth, and Bluetooth Low Energy (LE).

Certain wireless networks (such as LTE) utilize orthogonal frequency division multiplexing (OFDM) on the downlink and single-carrier frequency division multiplexing (SC-FDM) on the uplink. OFDM and SC-FDM partition the system bandwidth into multiple (K) orthogonal subcarriers, which are also commonly referred to as tones, bins, etc. Each subcarrier may be modulated with data. In general, modulation symbols are sent in the frequency domain with OFDM and in the time domain with SC-FDM. The spacing between adjacent subcarriers may be fixed, and the total number of subcarriers (K) may be dependent on the system bandwidth. For example, the spacing of the subcarriers may be 15 kHz and the minimum resource allocation (called a "resource block") may be 12 subcarriers (or 180 kHz). Consequently, the nominal Fast File Transfer (FFT) size may be equal to 128, 256, 512, 1024 or 2048 for system bandwidth of 1.25, 2.5, 5, 10 or 20 megahertz (MHz), respectively. The system bandwidth also may be partitioned into subbands. For example, a subband may cover 1.08 MHz (i.e., **6** resource blocks), and there may be 1, 2, 4, 8 or 16 subbands for system bandwidth of 1.25, 2.5, 5, 10 or 20 MHz, respectively.

Certain wireless networks in the communications system **100** may be non-public networks (NPNs) for non-public use. NPNs may include different types of networks. Some NPNs may be stand-alone non-public networks (SNPNs) that may be operated by an NPN operator and not rely on network functions provided by a public land mobile network (PLMN). Some NPNs may be public network integrated NPNs (PNI-NPNs) that may be non-public networks deployed with the support of PLMNs. PNI-NPNs may be deployed in different manners. One deployment for PNI-NPNs may include using slicing by allocating a network slice to an NPN. Another deployment for PNI-NPNs may include using closed access groups (CAGs).

While descriptions of some implementations may use terminology and examples associated with LTE technologies, some implementations may be applicable to other wireless communications systems, such as a new radio (NR) or 5G network. NR may utilize OFDM with a cyclic prefix (CP) on the uplink (UL) and downlink (DL) and include support for half-duplex operation using time division duplex (TDD). A single component carrier bandwidth of 100 MHz may be supported. NR resource blocks may span **12** subcarriers with a sub-carrier bandwidth of 75 kHz over a 0.1 milliseconds (ms) duration. Each radio frame may consist of 50 subframes with a length of 10 msec. Consequently, each subframe may have a length of 0.2 msec. Each subframe may indicate a link direction (i.e., DL or UL) for data transmission and the link direction for each subframe may be dynamically switched. Each subframe may include DL/UL data as well as DL/UL control data. Beamforming may be supported and beam direction may be dynamically configured. Multiple Input Multiple Output (MIMO) transmissions with precoding also may be supported. MIMO configurations in the DL may support up to eight transmit antennas with multi-layer DL transmissions up to eight streams and up to two streams per wireless device. Multi-layer transmissions with up to 2 streams per wireless device may be supported. Aggregation of multiple cells may be supported with up to eight serving cells. Alternatively, NR may support a different air interface, other than an OFDM-based air interface.

Some mobile devices may be considered machine-type communication (MTC) or evolved or enhanced machine-type communication (eMTC) mobile devices. MTC and eMTC mobile devices include, for example, robots, remote devices, sensors, meters, monitors, location tags, etc., that may communicate with a base station, another device (for example, remote device), or some other entity. A wireless node may provide, for example, connectivity for or to a network (for example, a wide area network such as Internet or a cellular network) via a wired or wireless communication link. Some mobile devices may be considered Internet-of-Things (IoT) devices or may be implemented as NB-IoT (narrowband internet of things) devices. A wireless device **120***a*-**120***e* may be included inside a housing that houses components of the wireless device, such as processor components, memory components, similar components, or a combination thereof.

In general, any number of communications systems and any number of wireless networks may be deployed in a given geographic area. Each communications system and wireless network may support a particular radio access technology (RAT) and may operate on one or more frequencies. A RAT also may be referred to as a radio technology, an air interface, etc. A frequency also may be referred to as a carrier, a frequency channel, etc. Each frequency may support a single RAT in a given geographic area in order to avoid interference between communications systems of different RATs. In some cases, NR or 5G RAT networks may be deployed.

In some examples, access to the air interface may be scheduled, where a scheduling entity (for example, a base station) allocates resources for communication among some or all devices and equipment within the scheduling entity's service area or cell. The scheduling entity may be responsible for scheduling, assigning, reconfiguring, and releasing resources for one or more subordinate entities. That is, for scheduled communication, subordinate entities utilize resources allocated by the scheduling entity.

Base stations are not the only entities that may function as a scheduling entity. In some examples, a wireless device may function as a scheduling entity, scheduling resources for one or more subordinate entities (for example, one or more other mobile devices). In this example, the wireless device is functioning as a scheduling entity, and other mobile devices utilize resources scheduled by the wireless device for wireless communication. A wireless device may function as a scheduling entity in a peer-to-peer (P2P) network, in a mesh network, or another type of network. In a mesh network example, mobile devices may optionally communicate directly with one another in addition to communicating with the scheduling entity.

Thus, in a wireless communication network with a scheduled access to time-frequency resources and having a cellular configuration, a P2P configuration, and a mesh configuration, a scheduling entity and one or more subordinate entities may communicate utilizing the scheduled resources.

In some implementations, two or more mobile devices **120***a*-**120***e* (for example, illustrated as the wireless device **120***a* and the wireless device **120***e*) may communicate directly using one or more sidelink channels **124** (for example, without using a base station **110***a*-**110***d* as an intermediary to communicate with one another). For example, the wireless devices **120***a*-**120***e* may communicate using peer-to-peer (P2P) communications, device-to-device (D2D) communications, a vehicle-to-everything (V2X) protocol (which may include a vehicle-to-vehicle (V2V) protocol, a vehicle-to-infrastructure (V2I) protocol, or similar protocol), a mesh network, or similar networks, or combinations thereof. In this case, the wireless device **120***a*-**120***e*

may perform scheduling operations, resource selection operations, as well as other operations described elsewhere herein as being performed by the base station **110***a*.

FIG. **2** shows a component block diagram illustrating an example computing system that may be configured to implement operations in an NG-RAN. Some implementations may be implemented on a number of single processor and multiprocessor computer systems, including a system-on-chip (SOC) or system in a package (SIP). FIG. **2** shows an example computing system or SIP **200** architecture that may be used in wireless devices (UE computing devices) implementing the various implementations.

With reference to FIGS. **1** and **2**, the illustrated example SIP **200** includes a two SOCs **202**, **204**, a clock **206**, and a voltage regulator **208**. In some implementations, the first SOC **202** operate as central processing unit (CPU) of the wireless device that carries out the instructions of software application programs by performing the arithmetic, logical, control and input/output (I/O) operations specified by the instructions. In some implementations, the second SOC **204** may operate as a specialized processing unit. For example, the second SOC **204** may operate as a specialized 5G processing unit responsible for managing high volume, high speed (for example 5 Gbps, etc.), or very high frequency short wavelength (for example 28 GHz mmWave spectrum, etc.) communications.

The first SOC **202** may include a digital signal processor (DSP) **210**, a modem processor **212**, a graphics processor **214**, an application processor **216**, one or more coprocessors **218** (for example vector co-processor) connected to one or more of the processors, memory **220**, custom circuitry **222**, system components and resources **224**, an interconnection/bus module **226**, one or more temperature sensors **230**, a thermal management unit **232**, and a thermal power envelope (TPE) component **234**. The second SOC **204** may include a 5G modem processor **252**, a power management unit **254**, an interconnection/bus module **264**, a plurality of mmWave transceivers **256**, memory **258**, and various additional processors **260**, such as an applications processor, packet processor, etc.

Each processor **210**, **212**, **214**, **216**, **218**, **252**, **260** in an apparatus (such as a processing system) may include one or more cores, and each processor/core may perform operations independent of the other processors/cores. For example, the first SOC **202** may include a processor that executes a first type of operating system (for example FreeBSD, LINUX, OS X, etc.) and a processor that executes a second type of operating system (for example MICROSOFT WINDOWS 10). In addition, any or all of the processors **210**, **212**, **214**, **216**, **218**, **252**, **260** may be included as part of a processor cluster architecture (for example a synchronous processor cluster architecture, an asynchronous or heterogeneous processor cluster architecture, etc.).

The first and second SOC **202**, **204** may include various system components, resources and custom circuitry for managing sensor data, analog-to-digital conversions, wireless data transmissions, and for performing other specialized operations, such as decoding data packets and processing encoded audio and video signals for rendering in a web browser. For example, the system components and resources **224** of the first SOC **202** may include power amplifiers, voltage regulators, oscillators, phase-locked loops, peripheral bridges, data controllers, memory controllers, system controllers, access ports, timers, and other similar components used to support the processors and software clients running on a wireless device. The system components and resources **224** or custom circuitry **222** also may include circuitry to interface with peripheral devices, such as cameras, electronic displays, wireless communication devices, external memory chips, etc.

The first and second SOC **202**, **204** may communicate via interconnection/bus module **250**. The various processors **210**, **212**, **214**, **216**, **218**, may be interconnected to one or more memory elements **220**, system components and resources **224**, and custom circuitry **222**, and a thermal management unit **232** via an interconnection/bus module **226**. Similarly, the processor **252** may be interconnected to the power management unit **254**, the mmWave transceivers **256**, memory **258**, and various additional processors **260** via the interconnection/bus module **264**. The interconnection/bus module **226**, **250**, **264** may include an array of reconfigurable logic gates or implement a bus architecture (for example CoreConnect, AMBA, etc.). Communications may be provided by advanced interconnects, such as high-performance networks-on chip (NoCs).

The first or second SOCs **202**, **204** may further include an input/output module (not illustrated) for communicating with resources external to the SOC, such as a clock **206** and a voltage regulator **208**. Resources external to the SOC (for example clock **206**, voltage regulator **208**) may be shared by two or more of the internal SOC processors/cores.

In addition to the example SIP **200** discussed above, some implementations may be implemented in a wide variety of processing systems, which may include a single processor, multiple processors, multicore processors, or any combination thereof.

FIG. **3** shows a component block diagram of an example software architecture including a radio protocol stack for the user and control planes in wireless communications. FIG. **3** shows an example of a software architecture **300** including a radio protocol stack for the user and control planes in wireless communications between a base station **350** (for example the base station **110***a*) and a wireless device **120** (for example the wireless device (UE computing device) **120***a*-**120***e*, **200**). With reference to FIGS. **1**-**3**, the wireless device **120** may implement the software architecture **300** to communicate with the base station **350** of a communication system (for example **100**). In some implementations, layers in software architecture **300** may form logical connections with corresponding layers in software of the base station **350**. The software architecture **300** may be distributed among one or more processing systems (for example the processors **212**, **214**, **216**, **218**, **252**, **260**). While illustrated with respect to one radio protocol stack, in a multi-SIM (subscriber identity module) wireless device, the software architecture **300** may include multiple protocol stacks, each of which may be associated with a different SIM (for example two protocol stacks associated with two SIMs, respectively, in a dual-SIM wireless communication device). While described below with reference to specific 5G-NR communication layers, the software architecture **300** may support any of variety of standards and protocols for wireless communications, or may include additional protocol stacks that support any of variety of standards and protocols wireless communications.

The software architecture **300** may include a Non-Access Stratum (NAS) **302** and an Access Stratum (AS) **304**. The NAS **302** may include functions and protocols to support packet filtering, security management, mobility control, session management, and traffic and signaling between a SIM(s) of the wireless device (for example SIM(s) **204**) and its core network **140**. The AS **304** may include functions and protocols that support communication between a SIM(s) (for

example SIM(s) **204**) and entities of supported access networks (for example a base station). In particular, the AS **304** may include at least three layers (Layer 1, Layer 2, and Layer 3), each of which may contain various sub-layers.

In the user and control planes, Layer 1 (L1) of the AS **304** may be a physical layer (PHY) **306**, which may oversee functions that enable transmission or reception over the air interface. Examples of such physical layer **306** functions may include cyclic redundancy check (CRC) attachment, coding blocks, scrambling and descrambling, modulation and demodulation, signal measurements, MIMO, etc. The physical layer may include various logical channels, including the Physical Downlink Control Channel (PDCCH) and the Physical Downlink Shared Channel (PDSCH).

In the user and control planes, Layer 2 (L2) of the AS **304** may be responsible for the link between the wireless device **120** and the base station **350** over the physical layer **306**. In some implementations, Layer 2 may include a media access control (MAC) sublayer **308**, a radio link control (RLC) sublayer **310**, and a packet data convergence protocol (PDCP) **312** sublayer, and a Service Data Adaptation Protocol (SDAP) **317** sublayer, each of which form logical connections terminating at the base station **350**.

In the control plane, Layer 3 (L3) of the AS **304** may include a radio resource control (RRC) sublayer 3. While not shown, the software architecture **300** may include additional Layer 3 sublayers, as well as various upper layers above Layer 3. In some implementations, the RRC sublayer **313** may provide functions INCLUDING broadcasting system information, paging, and establishing and releasing an RRC signaling connection between the wireless device **120** and the base station **350**.

In some implementations, the SDAP sublayer **317** may provide mapping between Quality of Service (QoS) flows and data radio bearers (DRBs). In the downlink, at the base station **350**, the SDAP sublayer **317** may provide mapping for DL QoS flows to DRBs. In the uplink, at the wireless device **120**, the SDAP sublayer **317** may deliver DL received QoS flows to upper layers. In some implementations, the PDCP sublayer **312** may provide uplink functions including multiplexing between different radio bearers and logical channels, sequence number addition, handover data handling, integrity protection, ciphering, and header compression. In the downlink, the PDCP sublayer **312** may provide functions that include in-sequence delivery of data packets, duplicate data packet detection, integrity validation, deciphering, and header decompression.

In the uplink, the RLC sublayer **310** may provide segmentation and concatenation of upper layer data packets, retransmission of lost data packets, and Automatic Repeat Request (ARQ). In the downlink, while the RLC sublayer **310** functions may include reordering of data packets to compensate for out-of-order reception, reassembly of upper layer data packets, and ARQ.

In the uplink, MAC sublayer **308** may provide functions including multiplexing between logical and transport channels, random access procedure, logical channel priority, and hybrid-ARQ (HARQ) operations. In the downlink, the MAC layer functions may include channel mapping within a cell, de-multiplexing, discontinuous reception (DRX), and HARQ operations.

While the software architecture **300** may provide functions to transmit data through physical media, the software architecture **300** may further include at least one host layer **314** to provide data transfer services to various applications in the wireless device **120**. In some implementations, application-specific functions provided by the at least one host layer **314** may provide an interface between the software architecture and the general purpose processor **206**.

In some other implementations, the software architecture **300** may include one or more higher logical layer (for example transport, session, presentation, application, etc.) that provide host layer functions. For example, in some implementations, the software architecture **300** may include a network layer (for example IP layer) in which a logical connection terminates at an access and mobility factor (AMF) or packet data network (PDN) gateway (PGW). In some implementations, the software architecture **300** may include an application layer in which a logical connection terminates at another device (for example end user device, server, etc.). In some implementations, the software architecture **300** may further include in the AS **304** a hardware interface **316** between the physical layer **306** and the communication hardware (for example one or more radio frequency (RF) transceivers).

FIG. **4** shows a component block diagram illustrating an example system configured for operations in an NG-RAN. In some implementations, the system **400** that may be implemented in a UE may an apparatus **402**. With reference to FIGS. **1-4**, the apparatus **402** may be implemented in a UE (for example the wireless devices **120**, **120***a*-**120***e*, **200**). The remote platform(s) **404** may include a base station (for example the base station **110***a*-**110***d*, **350**) or a wireless device (for example the wireless device **120**, **120***a*-**120***e*, **200**).

The apparatus **402** may be configured by machine-readable instructions **406**. Machine-readable instructions **406** may include one or more instruction modules. The instruction modules may include computer program modules. The instruction modules may include one or more of cell receiving module **408**, cell determination module **410**, network-identifier determination module **412**, SIB indicating module **414**, SIB validation module **416**, storage preventing module **418**, or other instruction modules.

Cell receiving module **408** may be configured to receive a SIB1 from a cell of the next generation radio access network. The cell may be a serving cell. In some implementations, the SIB1 may be received on a downlink-shared channel (DL-SCH).

Cell determination module **410** may be configured to determine whether the cell supports a non-public network (NPN) based on the received SIB1. In some aspects, the cell determination module **410** may be configured to determine whether the cell supports only a non-public network (NPN) based on the received SIB1.

Network-identifier determination module **412** may be configured to determine whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-identifier in a stored SIB in response to determining that the cell supports an NPN based on the received SIB1. In some aspects, the network-identifier determination module **412** may be configured to determine whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-identifier in a stored SIB in response to determining that the cell supports only an NPN based on the received SIB1.

Network-identifier determination module **412** may be configured to determine whether an NPN-ID in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed.

Network-identifier determination module **412** may be configured to determine whether an NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed. The

NPN-ID may be a SNPN-ID. The SIB1 may be received on a DL-SCH. The NPN-ID may be a combination of a public land mobile network (PLMN)-identifier (PLMN-ID) and a closed access group (CAG)-identifier (CAG-ID). The SIB1 may be received on a DL-SCH.

SIB indicating module **414** may be configured to indicate that the stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match.

SIB indicating module **414** may be configured to indicate any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed.

SIB validation module **416** may be configured to validate the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

Storage preventing module **418** may be configured to prevent storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed.

FIG. **5** shows a process flow diagram for an example method for implementing operations in an NG-RAN by an apparatus (such as a processing system) of a UE. With reference to FIGS. **1-5**, the method **500** may be implemented by an apparatus (such as a processing system) (such as **212**, **216**, **252** or **260**) of a UE (such as the wireless device **120**, **120***a*-**120***e*, **200**). The operations of method **500** may be performed in conjunction with the operations of method **600** or method **700**.

In block **502**, the apparatus (such as a processing system) may perform operations including receiving a SIB1 from a cell of the next generation radio access network. In some aspects, the SIB1 may be received on a downlink-shared channel (DL-SCH). In some aspects, the cell may be a serving cell.

In block **504**, the apparatus (such as a processing system) may perform operations including determining whether the cell supports NPNs based on the received SIB1. In some aspects, the apparatus (such as a processing system) may determine whether the cell supports only NPNs based on the received SIB1. In some aspects, the received SIB1 may indicate that the cell supports NPNs or only NPNs by one or more of an information element "cellreservedforotheruse" in the SIB1 set to true and at least one NPN-ID or CAG-ID indicated in the SIB1, an indication in the SIB1 indicates that the cell only provides access to NPNs, and only one PLMN-ID is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

In determination block **506**, the apparatus (such as a processing system) may perform operations to determine whether an NPN-ID in the received SIB1 matches an NPN-ID in a stored SIB in response to determining that the cell supports NPNs based on the received SIB1. In some aspects, the apparatus (such as a processing system) may perform operations to determine whether an NPN-ID in the received SIB1 matches an NPN-ID in a stored SIB in response to determining that the cell supports only NPNs based on the received SIB1. In some aspects, the NPN-ID may be a standalone NPN (SNPN)-identifier (SNPN-ID). In some aspects, the SNPN-ID may include a network identifier (NID) and optionally a public land mobile network (PLMN)-identifier (PLMN-ID). In some aspects, the NPN-ID is a combination of a public land mobile network (PLMN)-identifier (PLMN-ID) and a closed access group (CAG)-identifier (CAG-ID). In some aspects, only a first NPN-ID in the received SIB and only a first NPN-ID associated with the stored SIB are used to determine whether the NPN-ID in the received SIB1 matches the NPN-ID associated with the stored SIB.

In response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match (i.e., determination block **506**=No (or No match)), the apparatus (such as a processing system) may perform operations including validating the stored SIB based at least in part on the received SIB1 in block **512** indicating that the stored SIB is invalid in block **508**, and as a result, the apparatus (such as a processing system) will obtain a new SIB according to standard protocol procedures in block **510**.

In response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do match (i.e., determination block **506**=Yes (or Yes match)), the apparatus (such as a processing system) may perform operations including validating the stored SIB based at least in part on the received SIB1 in block **512**.

FIG. **6** shows a process flow diagram for an example method for implementing operations in an NG-RAN by an apparatus (such as a processing system) of a UE. With reference to FIGS. **1-6**, the method **600** may be implemented by an apparatus (such as a processing system) (such as **212**, **216**, **252** or **260**) of a UE (such as the wireless device **120**, **120***a*-**120***e*, **200**). The operations of method **600** may be performed in conjunction with the operations of method **500** or method **700**.

In block **502**, the apparatus (such as a processing system) may perform operations including receiving a SIB1 from a cell of the next generation radio access network as described for the like number block of the method **500** (FIG. **5**). In some aspects, the SIB1 may be received on a downlink-shared channel (DL-SCH). In some aspects, the cell may be a serving cell.

In block **504**, the apparatus (such as a processing system) may perform operations including determining whether the cell supports NPNs based on the received SIB1 as described for the like number block of the method **500** (FIG. **5**). In some aspects, determining whether the cell supports NPNs based on the received SIB1 may include determining whether the cell supports only NPNs based on the received SIB1. In some aspects, the received SIB1 may indicate that the cell supports only NPNs by one or more of an information element "cellreservedforotheruse" in the SIB1 set to true and at least one NPN-ID or CAG-ID indicated in the SIB1, an indication in the SIB1 indicates that the cell only provides access to NPNs, and only one PLMN-ID is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

In block **602**, the apparatus (such as a processing system) may perform operations including determining whether an NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed. In some aspects, the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN may be a first NPN in the received SIB1. In some aspects, the network identifier of the SNPN being locally managed may be indicated at least in part by one or more bits of the network identifier of the SNPN.

In block **604**, the apparatus (such as a processing system) may perform operations including preventing storage of the received SIB1 in response to determining that the NPN-ID

in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed.

FIG. **7** shows a process flow diagram for an example method for implementing operations in an NG-RAN by an apparatus (such as a processing system) of a UE. With reference to FIGS. **1-7**, the method **700** may be implemented by an apparatus (such as a processing system) (such as **212**, **216**, **252** or **260**) of a UE (such as the wireless device **120**, **120***a*-**120***e*, **200**). The operations of method **700** may be performed in conjunction with the operations of the method **500** or the method **600**.

In block **502**, the apparatus (such as a processing system) may perform operations including receiving a SIB1 from a cell of the next generation radio access network as described for the like number block of the method **500** (FIG. **5**). In some aspects, the SIB1 may be received on a downlink-shared channel (DL-SCH). In some aspects, the cell may be a serving cell.

In block **504**, the apparatus (such as a processing system) may perform operations including determining whether the cell supports NPNs based on the received SIB1 as described for the like number block of the method **500** (FIG. **5**). In some aspects, determining whether the cell supports NPNs based on the received SIB1 may include determining whether the cell supports only NPNs based on the received SIB1. In some aspects, the received SIB1 may indicate that the cell supports only NPNs by one or more of an information element "cellreservedforotheruse" in the SIB1 set to true and at least one NPN-ID or CAG-ID indicated in the SIB1, an indication in the SIB1 indicates that the cell only provides access to NPNs, and only one PLMN-ID is included in the information element "PLMN-IdentityInfo-List" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

In block **602**, the apparatus (such as a processing system) may perform operations including determining whether an NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed as described for the like number block of the method **600** (FIG. **6**). In some aspects, the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN may be a first NPN in the received SIB1. In some aspects, the network identifier of the SNPN being locally managed may be indicated at least in part by one or more bits of the network identifier of the SNPN.

In block **702**, the apparatus (such as a processing system) may perform operations including indicating any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a SNPN and a network identifier of the SNPN is locally managed.

FIG. **8** shows a component block diagram of an example network computing device **800**. Some implementations may be implemented on a variety of wireless network devices, an example of which is illustrated in FIG. **8** in the form of a wireless network computing device **800** functioning as a network element of a communication network, such as a base station. Such network computing devices may include at least the components illustrated in FIG. **8**. With reference to FIGS. **1-8**, the network computing device **800** may typically include an apparatus (such as a processing system) **801** coupled to volatile memory **802** and a large capacity nonvolatile memory, such as a disk drive **803**. The network computing device **800** also may include a peripheral memory access device such as a floppy disc drive, compact disc (CD) or digital video disc (DVD) drive **806** coupled to the apparatus (such as a processing system) **801**. The network computing device **800** also may include network access ports **804** (or interfaces) coupled to the apparatus (such as a processing system) **801** for establishing data connections with a network, such as the Internet or a local area network coupled to other system computers and servers. The network computing device **800** may include one or more antennas **807** for sending and receiving electromagnetic radiation that may be connected to a wireless communication link. The network computing device **800** may include additional access ports, such as USB, Firewire, Thunderbolt, and the like for coupling to peripherals, external memory, or other devices.

FIG. **9** shows a component block diagram of an example UE **900**. In various implementations, the UE **900** may be similar to the wireless devices **120**, **120***a*-**120***e*, **200** and include an apparatus **402** as shown in FIGS. **1-4**. With reference to FIGS. **1-9**, the UE **900** may include a first SOC **202** (for example a SOC-CPU) coupled to a second SOC **204** (for example a 5G capable SOC). The first and second SOCs **202**, **204** may be coupled to internal memory **906**, **916**, a display **912**, and to a speaker **914**. Additionally, the UE **900** may include an antenna **904** for sending and receiving electromagnetic radiation that may be connected to a wireless data link or cellular telephone transceiver **908** coupled to one or more processing systems in the first or second SOCs **202**, **204**. UE **900** typically also includes menu selection buttons or rocker switches **920** for receiving user inputs.

A UE **900** also includes a sound encoding/decoding (CODEC) circuit **910**, which digitizes sound received from a microphone into data packets suitable for wireless transmission and decodes received sound data packets to generate analog signals that are provided to the speaker to generate sound. Also, one or more of the processing systems in the first and second SOCs **202**, **204**, wireless transceiver **908** and CODEC **910** may include a digital signal processing system (DSP) circuit (not shown separately).

The processing systems of the wireless network **900** and the UE **900** may be any programmable microprocessor, microcomputer or multiple processor chip or chips that can be configured by software instructions (applications) to perform a variety of functions, including the functions of some implementations described below. In some mobile devices, multiple processors may be provided, such as one processor within an SOC **204** dedicated to wireless communication functions and one processor within an SOC **202** dedicated to running other applications. Typically, software applications may be stored in the memory **906**, **916** before they are accessed and loaded into the processing system. The processing systems may include internal memory sufficient to store the application software instructions.

Implementation examples are described in the following numbered clauses:

1. A method and an apparatus, a UE, and a non-transitory medium storing instructions implementing the method for wireless communication by a UE in an NG-RAN, including:

receiving, at the UE, a system information block (SIB) one (SIB1) from a cell of the NG-RAN;

determining, by the UE, whether the cell supports non-public networks (NPNs) based on the received SIB1;

determining, by the UE, whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1; and

validating, by the UE, the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

2. The method, apparatus, UE and non-transitory medium of clause 1, further including:

determining, by the UE, whether the cell supports NPNs based on the received SIB1 includes determining, by the UE, whether the cell supports only NPNs based on the received SIB; and

determining, by the UE, whether a NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1 includes determining, by the UE, whether an NPN-ID in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports only NPNs based on the received SIB1.

3. The method, apparatus, UE and non-transitory medium of any of clauses 1 or 2, further including indicating, by the UE, that the stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match.

4. The method, apparatus, UE and non-transitory medium of any of clauses 1-3, where the NPN-ID is a standalone NPN (SNPN)-identifier (SNPN-ID).

5. The method, apparatus, UE and non-transitory medium of clauses 4, where the SNPN-ID includes a network identifier (NID) and optionally a public land mobile network (PLMN)-identifier (PLMN-ID).

6. The method, apparatus, UE and non-transitory medium any of clauses 1-3, where the NPN-ID is a combination of a public land mobile network (PLMN)-identifier (PLMN-ID) and a closed access group (CAG)-identifier (CAG-ID).

7. The method, apparatus, UE and non-transitory medium of any of clauses 1-6, where only a first NPN-ID in the received SIB and only a first NPN-ID associated with the stored SIB are used to determine whether the NPN-ID in the received SIB1 matches the NPN-ID associated with the stored SIB.

8. The method, apparatus, UE and non-transitory medium of any of clauses 1-7, further including:

determining, by the UE, whether an NPN-identifier (NPN-ID) in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed.

9. The method, apparatus, UE and non-transitory medium of clause 8, where the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN is a first NPN in the received SIB1.

10. The method, apparatus, UE and non-transitory medium of any of clauses 8 or 9, further including:

preventing, by the UE, storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed.

11. The method, apparatus, UE and non-transitory medium of any of clauses 8 or 9, further including:

indicating, by the UE, any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed.

12. The method, apparatus, UE and non-transitory medium of any of clauses 8-11, where the network identifier of the SNPN being locally managed is indicated at least in part by one or more bits of the network identifier of the SNPN.

13. The method, apparatus, UE and non-transitory medium of any of clauses 1-12, where the SIB1 is received on a downlink-shared channel (DL-SCH).

14. The method, apparatus, UE and non-transitory medium of any of clauses 1-13, where the cell is a serving cell.

15. The method, apparatus, UE and non-transitory medium of any of clauses 1-14, where the received SIB1 indicates that the cell supports only NPNs by one or more of:

an information element "cellreservedforotheruse" in the SIB1 set to true and at least one standalone NPN (SNPN)-identifier (SNPN-ID) or a closed access group (CAG)-identifier (CAG-ID) indicated in the SIB1;

an indication in the SIB1 indicates that the cell only provides access to NPNs; and

only one PLMN-ID is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

Various implementations illustrated and described are provided merely as examples to illustrate various features of the claims. However, features shown and described with respect to any given implementation are not necessarily limited to the associated implementation and may be used or combined with other implementations that are shown and described. Further, the claims are not intended to be limited by any one example implementation. For example, one or more of the operations of the methods **500**, **600**, and **700** may be substituted for or combined with one or more operations of the methods **500**, **600**, and **700**.

As used in this application, the terms "component," "module," "system," and the like are intended to include a computer-related entity, such as, but not limited to, hardware, firmware, a combination of hardware and software, software, or software in execution, which are configured to perform particular operations or functions. For example, a component may be, but is not limited to, a process running on an apparatus (such as a processing system), a processing system, an object, an executable, a thread of execution, a program, or a computer. By way of illustration, both an application running on a wireless device and the wireless device may be referred to as a component. One or more components may reside within a process or thread of execution and a component may be localized on one processor or core of a processing system or distributed between two or more processors, cores or processing systems. In addition, these components may execute from various non-transitory computer readable media having various instructions or data structures stored thereon. Components may communicate by way of local or remote processes, function or procedure calls, electronic signals, data packets, memory read/writes, and other known network, computer, processing system, or process related communication methodologies.

A number of different cellular and mobile communication services and standards are available or contemplated in the future, all of which may implement and benefit from the various implementations. Such services and standards include, such as third generation partnership project (3GPP), long term evolution (LTE) systems, third generation wireless mobile communication technology (3G), fourth generation wireless mobile communication technology (4G), fifth generation wireless mobile communication technology (5G), global system for mobile communications (GSM), universal mobile telecommunications system (UMTS), 3GSM, general packet radio service (GPRS), code division multiple access (CDMA) systems (such as cdmaOne, CDMA1020™), enhanced data rates for GSM evolution (EDGE), advanced mobile phone system (AMPS), digital AMPS (IS-136/TDMA), evolution-data optimized (EV-

DO), digital enhanced cordless telecommunications (DECT), Worldwide Interoperability for Microwave Access (WiMAX), wireless local area network (WLAN), Wi-Fi Protected Access I & II (WPA, WPA2), and integrated digital enhanced network (iDEN). Each of these technologies involves, for example, the transmission and reception of voice, data, signaling, or content messages. It should be understood that any references to terminology or technical details related to an individual telecommunication standard or technology are for illustrative purposes only, and are not intended to limit the scope of the claims to a particular communication system or technology unless specifically recited in the claim language.

As used herein, a phrase referring to "at least one of" a list of items refers to any combination of those items, including single members. As an example, "at least one of: a, b, or c" is intended to cover: a, b, c, a-b, a-c, b-c, and a-b-c.

The various illustrative logics, logical blocks, modules, circuits and algorithm processes described in connection with the implementations disclosed herein may be implemented as electronic hardware, computer software, or combinations of both. The interchangeability of hardware and software has been described generally, in terms of functionality, and illustrated in the various illustrative components, blocks, modules, circuits and processes described above. Whether such functionality is implemented in hardware or software depends upon the particular application and design constraints imposed on the overall system.

The hardware and data processing apparatus (which may include a processing system) used to implement the various illustrative logics, logical blocks, modules and circuits described in connection with the aspects disclosed herein may be implemented or performed with a general purpose single- or multi-chip processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device, discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the functions described herein. A general purpose processor may be a microprocessor, or any conventional processor, controller, microcontroller, or state machine. The apparatus also may be implemented as a combination of computing devices, such as a combination of a DSP and a microprocessor, a plurality of microprocessors, one or more microprocessors in conjunction with a DSP core, or any other such configuration. In some implementations, particular processes and methods may be performed by circuitry that is specific to a given function.

In one or more aspects, the functions described may be implemented in hardware, digital electronic circuitry, computer software, firmware, including the structures disclosed in this specification and their structural equivalents thereof, or in any combination thereof. Implementations of the subject matter described in this specification also can be implemented as one or more computer programs, i.e., one or more modules of computer program instructions, encoded on a non-transitory processor-readable storage media for execution by, or to control the operation of, data processing apparatus.

If implemented in software, the functions may be stored on or transmitted over as one or more instructions or code on a computer-readable medium. The processes of a method or algorithm disclosed herein may be implemented in a processor-executable software module which may reside on a computer-readable medium. Computer-readable media includes both computer storage media and communication media including any medium that can be enabled to transfer a computer program from one place to another. A storage media may be any available non-transitory storage media that may be accessed by a computer. By way of example, and not limitation, such computer-readable media may include RAM, ROM, EEPROM, CD-ROM or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium that may be used to store desired program code in the form of instructions or data structures and that may be accessed by a computer. Also, any connection can be properly termed a computer-readable medium. Disk and disc, as used herein, includes compact disc (CD), laser disc, optical disc, digital versatile disc (DVD), floppy disk, and Blu-ray disc where disks usually reproduce data magnetically, while discs reproduce data optically with lasers. Combinations of the above should also be included within the scope of computer-readable media. Additionally, the operations of a method or algorithm may reside as one or any combination or set of codes and instructions on a machine readable medium and computer-readable medium, which may be incorporated into a computer program product.

In one or more aspects, the functions described may be implemented by an apparatus (such as a processing system), which may be coupled to a memory. The memory may be a non-transitory computer-readable storage medium that stores processor-executable instructions. The memory may store an operating system, user application software, or other executable instructions. The memory also may store application data, such as an array data structure. The apparatus (such as a processing system) may read and write information to and from the memory. The memory also may store instructions associated with one or more protocol stacks. A protocol stack generally includes computer executable instructions to enable communication using a radio access protocol or communication protocol.

Various modifications to the implementations described in this disclosure may be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other implementations without departing from the scope of this disclosure. Thus, the claims are not intended to be limited to the implementations shown herein, but are to be accorded the widest scope consistent with this disclosure, the principles and the novel features disclosed herein.

Certain features that are described in this specification in the context of separate implementations also can be implemented in combination in a single implementation. Conversely, various features that are described in the context of a single implementation also can be implemented in multiple implementations separately or in any suitable subcombination. Moreover, although features may be described above as acting in certain combinations and even initially claimed as such, one or more features from a claimed combination can in some cases be excised from the combination, and the claimed combination may be directed to a subcombination or variation of a subcombination.

Similarly, while operations are depicted in the drawings in a particular order, this should not be understood as requiring that such operations be performed in the particular order shown or in sequential order, or that all illustrated operations be performed, to achieve desirable results. Further, the drawings may schematically depict one more example process in the form of a flow diagram. However, other operations that are not depicted can be incorporated in the example processes that are schematically illustrated. For example, one or more additional operations can be performed before, after, simultaneously, or between any of the illustrated operations. In certain circumstances, multitasking

and parallel processing may be advantageous. Moreover, the separation of various system components in the implementations described above should not be understood as requiring such separation in all implementations, and it should be understood that the described program components and systems can generally be integrated together in a single software product or packaged into multiple software products. Additionally, other implementations are within the scope of the following claims. In some cases, the actions recited in the claims can be performed in a different order and still achieve desirable results.

What is claimed is:

1. A method for wireless communication performed by an apparatus of a user equipment (UE) in a next generation (NG) radio access network (RAN) (NG-RAN), comprising:

receiving, at the UE, a system information block (SIB) one (SIB1) from a cell of the NG-RAN;

determining, by the UE, whether the cell supports non-public networks (NPNs) based on the received SIB1;

determining, by the UE, whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1;

determining, by the UE, whether the NPN-identifier (NPN-ID) in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed;

preventing, by the UE, storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with the SNPN and the network identifier of the SNPN is locally managed; and

validating, by the UE, the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

2. The method of claim **1**, further comprising:

determining, by the UE, whether the cell supports NPNs based on the received SIB1 comprises determining, by the UE, whether the cell supports only NPNs based on the received SIB1; and

determining, by the UE, whether a NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1 comprises determining, by the UE, whether an NPN-ID in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports only NPNs based on the received SIB1.

3. The method of claim **1**, further comprising:

indicating, by the UE, that the stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match.

4. The method of claim **1**, wherein the NPN-ID is a combination of a public land mobile network (PLMN)-identifier (PLMN-ID) and a closed access group (CAG)-identifier (CAG-ID).

5. The method of claim **1**, wherein only a first NPN-ID in the received SIB and only a first NPN-ID associated with the stored SIB are used to determine whether the NPN-ID in the received SIB1 matches the NPN-ID associated with the stored SIB.

6. The method of claim **1**, wherein the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN is a first NPN in the received SIB1.

7. The method of claim **1**, further comprising:

indicating, by the UE, any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed.

8. The method of claim **1**, wherein the network identifier of the SNPN being locally managed is indicated at least in part by one or more bits of the network identifier of the SNPN.

9. The method of claim **1**, wherein the SIB1 is received on a downlink-shared channel (DL-SCH).

10. The method of claim **1**, wherein the cell is a serving cell.

11. The method of claim **1**, wherein the received SIB1 indicates that the cell supports only NPNs by one or more of:

an information element "cellreservedforotheruse" in the SIB1 set to true and at least one standalone NPN (SNPN)-identifier (SNPN-ID) or a closed access group (CAG)-identifier (CAG-ID) indicated in the SIB1;

an indication in the SIB1 indicates that the cell only provides access to NPNs; and only one a public land mobile network (PLMN)-identifier (PLMN-ID) is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

12. An apparatus of a user equipment (UE), comprising:

a first interface configured to receive a system information block (SIB) one (SIB1) from a cell of a next generation (NG) radio access network (RAN) (NG-RAN); and

a processing system coupled to the first interface and configured to:

determine whether the cell supports non-public networks (NPNs) based on the received SIB1;

determine whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1;

determine whether the NPN-identifier (NPN-ID) in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed;

prevent storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with the SNPN and the network identifier of the SNPN is locally managed; and

validate the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

13. The apparatus of claim **12**, wherein the processing system is further configured to:

determine whether the cell supports NPNs based on the received SIB1 by determining whether the cell supports only NPNs based on the received SIB1; and

determine whether a NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1 by determining whether an NPN-ID in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports only NPNs based on the received SIB1.

14. The apparatus of claim **12**, wherein the processing system is further configured to:

indicate that the stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB do not match.

15. The apparatus of claim **12**, wherein the processing system is configured such that the NPN-ID is a combination of a public land mobile network (PLMN)-identifier (PLMN-ID) and a closed access group (CAG)-identifier (CAG-ID).

16. The apparatus of claim **12**, wherein the processing system is configured such that only a first NPN-ID in the received SIB and only a first NPN-ID associated with the stored SIB are used to determine whether the NPN-ID in the received SIB1 matches the NPN-ID associated with the stored SIB.

17. The apparatus of claim **12**, wherein the processing system is configured such that the NPN-ID in the received SIB1 that indicates that the cell is associated with the SNPN is a first NPN in the received SIB1.

18. The apparatus of claim **12**, wherein the processing system is further configured to:

indicate any stored SIB is invalid in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with a standalone SNPN and a network identifier of the SNPN is locally managed.

19. The apparatus of claim **12**, wherein the first interface is configured such that the SIB1 is received on a downlink-shared channel (DL-SCH).

20. The apparatus of claim **12**, wherein the received SIB1 indicates that the cell supports only NPNs by one or more of:

an information element "cellreservedforotheruse" in the SIB1 set to true and at least one standalone NPN (SNPN)-identifier (SNPN-ID) or a closed access group (CAG)-identifier (CAG-ID) indicated in the SIB1;

an indication in the SIB1 indicates that the cell only provides access to NPNs; and

only one a public land mobile network (PLMN)-identifier (PLMN-ID) is included in the information element "PLMN-IdentityInfoList" in the SIB1 and the PLMN-ID is a value associated with indicating NPN support.

21. A non-transitory processor-readable medium having stored thereon processor-executable instructions configured to cause a user equipment (UE) processing system to perform operations comprising:

receiving a system information block (SIB) one (SIB1) from a cell of a next generation (NG) radio access network (RAN) (NG-RAN); and

determining whether the cell supports non-public networks (NPNs) based on the received SIB1;

determining whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1;

determining whether the NPN-identifier (NPN-ID) in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed;

preventing storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with the SNPN and the network identifier of the SNPN is locally managed; and

validating the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

22. A user equipment (UE), comprising:

means for receiving a system information block (SIB) one (SIB1) from a cell of a next generation (NG) radio access network (RAN) (NG-RAN);

means for determining whether the cell supports non-public networks (NPNs) based on the received SIB1;

means for determining whether an NPN-identifier (NPN-ID) in the received SIB1 matches an NPN-ID associated with a stored SIB in response to determining that the cell supports NPNs based on the received SIB1;

means for determining whether the NPN-identifier (NPN-ID) in the received SIB1 indicates that the cell is associated with a standalone NPN (SNPN) and a network identifier of the SNPN is locally managed;

means for preventing storage of the received SIB1 in response to determining that the NPN-ID in the received SIB1 indicates that the cell is associated with the SNPN and the network identifier of the SNPN is locally managed; and

means for validating the stored SIB based at least in part on the received SIB1 in response to determining that the NPN-ID in the received SIB1 and the NPN-ID associated with the stored SIB match.

* * * * *